EIS scoping statement regarding Proposed Gateway Pacific Terminal

Considerations: Climate Change, Rain Fall, Soil Saturation, Vibration due to Increasing Train Traffic, Soil Liquefaction, Derailment, Loss of Life, Property Damage and Bay Contamination

Dear Army Corps of Engineers, Department of Ecology and Whatcom County Council:

I live on Chuckanut Bay. My wife Joanne & I are truly blessed to live in such a beautiful and unspoiled setting.

I am concerned about significant, unavoidable, and adverse impacts due to increased heavy coal trains, which will cause landslides and train derailment.

In the last 3 years two of my neighbors experienced landslides that covered the tracks in mud and debris. The on coming train could not stop in time and blasted through the slides. There is a risk of the loss of human life and contamination of our bay caused by train derailment due to landslides.

I want to address my concern with the increase in heavy rail traffic along the BNSF route which passes through my property and the approximately 17 mile stretch between the small town of Blanchard and north Bellingham.

Specifically, I will tie together existing information to demonstrate that there is an existing slope stability and landslide problem along this 17 mile rail, which is a part of the proposed route for the trains which will feed the coal to the proposed Gateway Terminal. The increase in traffic will only increase the existing landslide problem.

It is well documented that the frequency of land slides along the coast due to rail traffic has increased.

As reported by Crosscut.com (1): "According to WSDOT's data, the number of days when services were disrupted in the year's first quarter climbed from four in 2009 to 10 in 2010 and finally to 33 in 2011. That's an increase of 725 percent in two years."

"Coal and oil trains rank among the heaviest carried by the railroads. BNSF won't divulge details, but a review of U.S. Customs data indicates that the coal trains began running regularly about January 2010, when exports of coal through the Seattle customs district, for shipment from British Columbia to China, show a sharp increase. The spike [*in train traffic*] coincides roughly with the increase in mudslides along the Seattle-Vancouver route." (1)

" Rex Baum, [Supervisory Research Geologist] who researched the 1997 landslide for the U.S. Geological Survey, recalled that the slide that pushed the rail cars into the Sound came a couple of weeks after the heaviest rainfall. He noted that the area has geologic conditions that lead to this sort of sliding: clay-

type soils along the toe of a bluff, with fine sandy soil as a cover. When the soil becomes saturated and more rain hits, the sandy soil slides off the clay (to over-simplify a complex matter). Baum told us that these conditions haven't changed a great deal over time, and are not likely to change in the future." (1)

A report more recently on the Union Bulletin website (2) stated: "Heavy precipitation continues to affect railroad travel in the western part of the state. A railroad spokesman says a fresh mudslide hit tracks north of Seattle, triggering yet another 48-hour moratorium on passenger train service between Seattle and Everett."

"There have been numerous incidences of landslides, especially along the coastal route from Seattle to Bellingham. There was a major slide on December 18, 2012, near Everett and two other slides on January 4 and January 13, 2013 near Mukilteo." (2)

The Burlington Northern and Santa Fe spokesman, Gus Melonas, stated that the recent slide that occurred in the Everett/Mukilteo area on January 9th, 2013 was "the 73rd slide along the rail tracks between Seattle and Everett since Thanksgiving." (2)

That is a significent number of landslides by anyone's standards, 73 landslides occurred in less than 2 months. This is a serious issue which needs to be considered in the EIS for the Cherry Point Terminal proposal.

Analysis of the data:

In looking for authoritative data to support the idea that an increase in heavy train traffic will increase the number of landslides as the Crosscut.com article proposes, there are five factors to consider:

1. Stability of the slopes along the railway
2. The rain fall causing saturated soil
3. The increase in heavy train traffic
4. The increased vibration caused by increasing trains
5. The soil liquefaction caused by the vibration and saturated soil

Regarding slope stability:

The Washington State Department of Ecology website titled, "Puget Sound Landslides" (3) provides a series of maps covering 12 western counties of the state. These maps provide information on the stability of the slopes.

Given on the website are detailed maps which include the 17 mile route from Blanchard to Airport Dr. This is the section along the shore line which is of concern for me in the study of this data. These maps show very detailed slope stability ratings, from "Stable" to "Unstable". Through examination of these maps, it is possible to get a detailed breakdown of the relative slope stabilities.

The Washington State Department of Ecology data given on these maps illustrates that there is only 4.8 out of 17 miles that is classified as stable. Percentage wise, there is only 29% of these 17 miles which is stable. This is according to the authority of the Washington State Department of Ecology.

Regarding Rain Fall and Climate Change:

According to Wikipedia (4): "In the majority of cases the main trigger of landslides is heavy or prolonged rainfall. Generally this takes the form of either an exceptional short lived event, such as the passage of a tropical cyclone or even the rainfall associated with a particularly intense thunderstorm or of a long duration rainfall event with lower intensity."

"University of Washington geologist David Montgomery, who studies landslides, told Crosscut that there are three main factors in slides like those along the Seattle-Vancouver corridor: 1) state of the land; and whether there are trees, vegetation and root systems to hold the soil; 2) intensity or duration of rainfall; and 3) saturation; a good long soak weakens the soil for the next downpour." (1)

According to the U.S. Global Change Research Program (5) "Human activities have affected the land, oceans, and atmosphere, and these changes have altered global climate patterns. Burning fossil fuels *[think coal],* releasing chemicals into the atmosphere, reducing the amount of forest cover, and rapid expansion of farming, development, and industrial activities are releasing carbon dioxide into the atmosphere and changing the balance of the climate system."

"Extreme precipitation episodes (heavy downpours) have become more frequent and more intense in recent decades over most of North America and now account for a larger percentage of total precipitation. For example, intense precipitation (the heaviest 1% of daily precipitation totals) in the continental U.S. increased by 20% over the past century while total precipitation increased by 7%." (5)

Regarding Train Traffic Increases:

According to Crosscut.com (1) "Amtrak travel continues to increase here, and passenger-rail advocates are pressing to add a third round-trip between Seattle and Vancouver. Indeed, the Washington State Department of Transportation's long-range plan calls for four such round-trips."

"Increased rail freight traffic is already beginning, with more on the horizon. In particular, Asian customers are generating demand for bulk commodities such as coal, potash and grain, and rail is the conveyance of choice to Pacific ports. BNSF will not comment on the volume of the coal traffic, but a camera installed by CommunityWise Bellingham, a citizens' group formed in response to the Gateway Pacific Terminal proposal focused on shipping coal to China, found an average of about four coal trains a day (two full and two empty return trips) last

summer running between Seattle and Vancouver, B.C. where the cargo is transferred into ships. Anecdotal evidence indicates present traffic may be somewhat higher, and CWB plans to re-activate its camera." (1)

"If the giant Gateway Pacific Terminal is built at Cherry Point, north of Bellingham, the corridor could see as many as 18 more daily coal-train movements, according to BNSF, quoted on the Gateway Pacific web site. Tesoro's refinery at Anacortes is expected to add to the traffic in 2012, bringing crude oil from North Dakota's giant Bakken fields to the Anacortes facility; the volume is likely to represent two unit trains per day, one arriving and one returning." (1)

Regarding Vibrations:

According to Wikipedia (4): "The passage of the earthquake waves through the rock and soil produces a complex set of accelerations that effectively act to change the gravitational load on the slope. So, for example, vertical accelerations successively increase and decrease the normal load acting on the slope. Similarly, horizontal accelerations induce a shearing force due to the inertia of the landslide mass during the accelerations. These processes are complex, but can be sufficient to induce failure of the slope. These processes can be much more serious in mountainous areas in which the seismic waves interact with the terrain to produce increases in the magnitude of the ground accelerations. This process is termed 'topographic amplification'. The maximum acceleration is usually seen at the crest of the slope or along the ridge line, meaning that it is a characteristic of seismically triggered landslides that they extend to the top of the slope."

Being considered train induced the effect of train vibrations on the slope below the cliff on Eldridge Avenue, a study was performed. According to the source, Washington State Ecology Department, a Environmental Planner (6) "An engineering study done around 1995 (or perhaps earlier) by BNSF, COB *[City of Bellingham]* and the Eldridge Homeowners Association found a lot of vibration from the passing trains, but considering the volume of traffic at that time did not see the situation as being very serious.

"The study included borings down to the bottom of the bluff to check the make-up of the earth, however, and confirmed a consistent, clayish material all the way down which, when it got good and wet, would lose all its strength. The borings also identified a geological "lens" of water about 24 feet above the toe of the bluff. That could also contribute to an unstable situation following very heavy rains, with super-saturated soil potentially creating a slippery layer in the bluff's structure. Significant vibrations would further complicate the situation." (6)

The additional heavy coal trains could create the "significant vibrations" cautioned against in the above. The study of this impact needs to be added to the EIS Scope.

Regarding Soil Liquefaction

According to Wikipedia (4): "The passage of the earthquake waves through a granular material such as a soil can induce a process termed liquefaction, in which the shaking causes a reduction in the pore space of the material. This densification drives up the pore pressure in the material. In some cases this can change a granular material into what is effectively a liquid, generating 'flow slides' that can be rapid and thus very damaging. Alternatively, the increase in pore pressure can reduce the normal stress in the slope, allowing the activation of translational and rotational failures."

According to Wikipedia (7): "Soil liquefaction describes a phenomenon whereby a saturated soil substantially loses strength and stiffness in response to an applied stress, usually earthquake shaking or other sudden change in stress condition, causing it to behave like a liquid."

The "other sudden change in stress condition" would be the induced vibration of many heavily loaded coal trains.

Here is a simple example of liquefaction. My uncle made gold jewelry. He would first make a mold and then pour the molten gold into the mold. However, the gold would just sit on top and not flow into the mold. To activate the flow he used a vibrating plate onto which he placed the mold. Instantly, that small amount of vibration would cause the gold to flow into every little detail of his mold. The vibration causes the gold to flow. This is an example of liquefaction.

In Summary:

- Landslides cause human deaths and property damage.
- There is a history of slides and damage along the BNSF Seattle to Vancouver right of way.
- These slides occur where the slope is unstable.
- The WA Dept. of Ecology data states these slopes are unstable along the BNSF right of way.
- Causes of the slides:
    - composition of the soil
    - water saturation of the soil
    - human activation, vibration
- History demonstrates that there are currently slide problems at the present train traffic levels.
- Rainfall will increase intensity and yield higher soil saturation due to climate change.
- More landslides will occur due to increased soil saturation on unstable slopes
- Heavy train traffic will increase if Gateway Terminal project is approved
- Increases in train traffic will further stress the unstable and water saturated slopes.
- More landslides posses higher risk to human's and property

- WSDOT plans to increase the number of Amtrak Seattle to Vancouver round trips to four.
    - Further increasing rail usage
    - Putting more humans in harms way.
- Burning fossil fuels worsens climate change.
- And coming full circle, climate change will cause increases to rain fall.

According to Crosscut.com (1) "It's a matter of safety for passengers, and of legal liability for the huge railroad, and slides are certainly not a casual matter. On Jan. 15, 1997, a huge mudflow knocked five cars of a BNSF freight train into Puget Sound near Woodway in Snohomish County, two hours after an Amtrak train and its passengers had passed through. Passenger service had been suspended from Dec. 27 to Jan. 12 because of landslides launched by heavy rains."

I am asking that the study of the effect that additional heavy rail traffic has on landslides along the BNSF right-of-way be added to the scope of the EIS. At risk is the loss of human life and contamination of Chuckanut Bay due to coal train derailments. This scoping statement deals with the specific section along the shore line in Skagit and Whatcom counties. The impact of increased heavy train traffic and rainfall on landslides and train derailment must a be part of the EIS scope and studied for the entire coal train route; beginning at the coal mines to the proposed coal shipping terminal at Cherry Point.

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References and Links:

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(3) The Washington State Department of Ecology website: "Puget Sound Landslides", http://www.ecy.wa.gov/programs/sea/landslides/index.html
(4) Wikipedia, "Causes of Landslides", http://en.wikipedia.org/wiki/Causes_of_landslides
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(6) Phone conversation between Ken Kaliher and a Washington State Ecology Department Environmental Planner, Friday, 4 Nov 2011
(7) Wikipedia, "Soil Liquefaction", http://en.wikipedia.org/wiki/Soil_liquefaction